

Time : 3 Hours

Maximum Marks : 180

PART – 1 : MATHEMATICS

- This question paper contains two sections, section A & B.
- **Section A** contains 20 multiple choice questions (**MCQs**) with four options (A),(B),(C),(D) out of which only one option is correct.
- **Section B** contains 10 **Numerical Value Type** questions , out of which candidate have to attempt only 5 questions.

Section 1

- This Section contain 20 questions (Q.No. 1 to Q.No. 20)
- Answer to each question in **Section A** will be evaluated according to the following marking scheme:
- Full Marks : **+4** for correct answer
- Zero Marks : **0** If the question is unanswered;
- Negative Marks : **-1** for incorrect answer

1. If $x = \log_a (bc), y = \log_b (ca), z = \log_c (ab)$, then which of the following is equal to 1 ?
 (A) $x + y + z$ (B) $(1 + x)^{-1} + (1 + y)^{-1} + (1 + z)^{-1}$
 (C) xyz (D) none of these
2. If $x^{\log_y x} = 256$ & $y^{\log_x y} = 2$ then which of the following is correct?
 (A) $y = x^2$ (B) $y = x$ (C) $y^2 = x$ (D) $xy = 1$
3. If $\sqrt{\log_2 x} - 0.5 = \log_2 \sqrt{x}$, then x equals
 (A) odd integer (B) prime number
 (C) composite number (D) irrational
4. Logarithm of $32\sqrt[5]{4}$ to the base $2\sqrt{2}$ is
 (A) 3.6 (B) 5 (C) 5.6 (D) none of these]
5. If $\log_e \left(\frac{a+b}{2} \right) = \frac{1}{2} (\log_e a + \log_e b)$, then relation between a and b will be
 (A) $a = b$ (B) $a = b/2$ (C) $a = 2b$ (D) $a = b/3$
6. Which of the following does not hold good?
 (A) $\log_{1/6} 2 \cdot \log_3 4 \cdot \log_{1/2} 6 \cdot \log_8 9 = 4/3$ (B) $\log (1 + 2 + 3) = \log 1 + \log 2 + \log 3$
 (C) $\log_2 \left(\frac{8}{2} \right) = \frac{\log_2 8}{\log_2 2}$ (D) $(\log p)^2 - (\log q)^2 = (\log pq) \left(\log \frac{p}{q} \right)$
7. If $3^{x+1} = 6^{\log_2 3}$ then x is
 (A) 3 (B) 2 (C) $\log_3 2$ (D) $\log_2 3$

8. If $\log_{10} 3 = 0.477$, the no. of digits in 3^{40} is
(A) 18 (B) 19 (C) 20 (D) 21
9. The expression, $(\sqrt[6]{9 + 4\sqrt{5}} + \sqrt[3]{2 + \sqrt{5}}) \cdot \sqrt[3]{\sqrt{5} - 2}$ simplifies to:
(A) $\sqrt{2}$ (B) $2^{1/2}$ (C) $2\sqrt{2}$ (D) 2
10. If $a + b + c = 0$ & $a^2 + b^2 + c^2 = 1$ then the value of $a^4 + b^4 + c^4$ is -
(A) 1 (B) 4 (C) $\frac{1}{2}$ (D) $\frac{1}{4}$
11. If $x = \log_k b = \log_b c = \frac{1}{2} \log_c d$, then $\log_k d$ is equal to -
(A) $6x$ (B) $\frac{x^3}{2}$ (C) $2x^3$ (D) $2x^6$
12. $\frac{(x-2)^{10000}(x+1)^{252}(x-1/2)^{94}(x+8)^4}{x^{300}(x-3)^{25}(x+2)^{25}} \leq 0$, then
(A) $x \in (-2, -1] \cup [1/2, 3)$ (B) $x \in \{-8\} \cup (-2, -1] \cup [1/2, 3)$
(C) $x \in \{-\theta\} \cup (-2, 3)$ (D) None of these
13. If $\tan\left(\frac{\alpha}{2}\right)$ and $\tan\left(\frac{\beta}{2}\right)$ are the roots of the equation $8x^2 - 26x + 15 = 0$ then $\cos(\alpha + \beta)$ is equal to
(A) $-\frac{627}{725}$ (B) $\frac{627}{725}$ (C) $-\frac{725}{627}$ (D) -1
14. If $\frac{2\sin\alpha}{1 + \sin\alpha + \cos\alpha} = \lambda$ then $\frac{1 + \sin\alpha - \cos\alpha}{1 + \sin\alpha}$ is equal to-
(A) $\frac{1}{2}$ (B) λ (C) $1 - \lambda$ (D) $1 + \lambda$
15. $\left(1 + \cos\frac{\pi}{8}\right)\left(1 + \cos\frac{3\pi}{8}\right)\left(1 + \cos\frac{5\pi}{8}\right)\left(1 + \cos\frac{7\pi}{8}\right)$ is equal to
(A) $\frac{1}{2}$ (B) $\cos\frac{\pi}{8}$ (C) $\frac{1}{8}$ (D) $\frac{1+\sqrt{2}}{2\sqrt{2}}$
16. The minimum value of $\cos(\cos x)$ is
(A) 0 (B) $-\cos 1$ (C) $\cos 1$ (D) -1
17. $\sin 47^\circ + \sin 61^\circ - \sin 11^\circ - \sin 25^\circ$ is equal to
(A) $\sin 36^\circ$ (B) $\cos 36^\circ$ (C) $\sin 70^\circ$ (D) $\cos 70^\circ$
18. If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$ then $\cos\theta - \sin\theta$ is equal to
(A) $\sqrt{2}\cos\theta$ (B) $\sqrt{2}\sin\theta$
(C) $\sqrt{2}(\cos\theta + \sin\theta)$ (D) None of these
19. The expression $\sin 27^\circ \cos 57^\circ \sin 87^\circ$ simplifies to
(A) $\frac{\sin 9^\circ}{4}$ (B) $\frac{\cos 9^\circ}{4}$ (C) $\frac{\sin 9^\circ}{2}$ (D) $\frac{\cos 9^\circ}{2}$
20. If $\pi < \alpha < \frac{3\pi}{2}$, then $\sqrt{\frac{1-\cos\alpha}{1+\cos\alpha}} + \sqrt{\frac{1+\cos\alpha}{1-\cos\alpha}}$ is equal to
(A) $\frac{2}{\sin\alpha}$ (B) $-\frac{2}{\sin\alpha}$ (C) $\frac{1}{\sin\alpha}$ (D) $-\frac{1}{\sin\alpha}$

Section 2

- This Section contain 10 questions (Q.No. 21 to Q.No. 30) whose answer to be filled as numerical value (**Attempt any five**)
- Answer to each question in **Section B** will be evaluated according to the following marking scheme:
- Full Marks : +4 for correct answer
- Zero Marks : 0 If the question is unanswered;
- Zero Marks : 0 for incorrect answer

21. The value of $\sin(\pi + \theta)\sin(\pi - \theta)\operatorname{cosec}^2\theta$ is equal to
22. If $\sin\theta + \operatorname{cosec}\theta = 2$, then $\sin^4\theta + \operatorname{cosec}^4\theta$ is equal to
23. a, b, c are reals such that $a + b + c = 3$ and $\frac{1}{a+b} + \frac{1}{b+c} + \frac{1}{c+a} = \frac{10}{3}$
The value of $\left\{\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b}\right\}$ is
24. If $\log_4 2 + \log_4 4 + \log_4 x + \log_4 16 = 6$, then $x =$
25. Value of

$$9^{\log_{\frac{1}{3}}\left(\frac{1}{\sqrt{2}}\right)} + \log_{\sqrt{2}} \frac{1}{\sqrt{3} + \sqrt{4}} + \log_{\frac{1}{2}} \left(\frac{1}{7 + 2\sqrt{2}}\right)$$
26. $\frac{\cos 20^\circ + 8\sin 70^\circ \sin 50^\circ \sin 10^\circ}{\sin^2 80^\circ}$ is equal to -
27. If $\frac{\ln a}{b-c} = \frac{\ln b}{c-a} = \frac{\ln c}{a-b}$ then the value of $a^{b+c} \cdot b^{c+a} \cdot c^{a+b}$ is equal to
28. If $[1 - \sin(\pi + \alpha) + \cos(\pi + \alpha)]^2 + \left[1 - \sin\left(\frac{3\pi}{2} + \alpha\right) + \cos\left(\frac{3\pi}{2} - \alpha\right)\right]^2 = a + b\sin 2\alpha$
then the value of $(a + b)$ is
29. $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x)$ is equal to
30. The value of $2\cos 2 - 4\sin\left(1 + \frac{\pi}{6}\right)\cos\left(1 + \frac{\pi}{3}\right)$ is

ANSWER KEY

SECTION - 1							
MATHS	Q.	1	2	3	4	5	6
	A.	B	C	B	A	A	C
	Q.	7	8	9	10	11	12
	A.	D	C	D	C	C	B
	Q.	13	14	15	16	17	18
	A.	A	B	C	C	D	B
	Q.	19	20				
	A.	B	B				
	SECTION - 2						
	Q.	21	22	23	24	25	26
	A.	-1	2	7	32	2	2
	Q.	27	28	29	30		
	A.	1	2	13	1		